Spot Safety Project Evaluation

Project Log # 200702026

Spot Safety Project # 06-00-400

Spot Safety Project Evaluation of the
Paved Shoulder addition on SR 2220 (Tom Starling Road) from
Tippit Trail (MP 1.76) to Production Drive (MP 2.39)
Cumberland County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 12-18-2007
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-00-400 – Segment of SR 2220 (Tom Starling Rd) from Tippit Trail (MP 1.76) to Production Drive (MP 2.39) in Cumberland County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of 2-foot additional paved shoulders on both sides of the roadway. In the study period, SR 2220 (Tom Starling Road) is a two-lane, two-way facility in an industrial development zone. The speed limit on this section of roadway is 55 mph.

The original statement of problem was the pattern of ran-off road accidents due to severe reverse curves and lack of paved shoulders, not allowing motorists adequate recovery area. This location was presented in both the 1998 and 2000 Highway Safety Improvement Program.

The initial crash analysis was completed from November 1, 1996 to October 31, 1999 with twenty-seven (27) reported crashes, twenty-one (21) deemed correctable by the proposed countermeasure. The final completion date for the improvement at the subject intersection was on May 31, 2002 with a total cost of $20,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from March 1, 2002 to August 31, 2002. The before period consisted of reported crashes from December 1, 1997 through February 28, 2002 (4 years and 3 months) and the after period consisted of reported crashes from September 1, 2002 through November 30, 2006 (4 years and 3 months). The ending date for this analysis was determined by date of available crash data at the time of analysis.

The treatment data consisted of all crashes within the segment on SR 2220 (Tom Starling Rd) from Tippit Trail (MP 1.76) to Production Drive (MP 2.39). *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Fixed Object, Overturn/Rollover, Parked Vehicle, Ran-off Roadway and Head-on collisions were the target crashes for the applied. These crash types occur when vehicles loose control or overcorrect after leaving the roadway.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	23	11	- 52.17 %
Total Severity Index	12.42	5.71	- 54.03 %
Target Crashes	19	10	- 47.37 %
Target Crash Severity Index	9.66	5.44	- 43.69 %
Volume	3,000	2,800	- 6.67 %
Injury Crash Summary			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	2	0	- 100.00 %
Class B injury Crashes	8	2	- 75.00 %
Class C Injury Crashes	7	5	- 28.57 %
Total Injury Crashes	17	7	-58.82 %

The naive before and after analysis at the treatment location resulted in a 52 percent decrease in Total Crashes, a 47 percent decrease in Target Crashes, and a 54 percent decrease in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 52 percent decrease in Total Crashes and a 47 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, the majority of crashes along this roadway segment in the before period (18 of 23) were the result of a vehicle leaving the roadway. Speed appears to be a contributing factor in the majority of these crashes as vehicles took the two sharp curves above the advisory posted speed limit. The addition of the 2-foot paved shoulders appears to have provided motorists room to recover since ran-off road crashes reduced to ten (10) crashes. Speed continues to be the main contributing factor based on documented speed at impact.

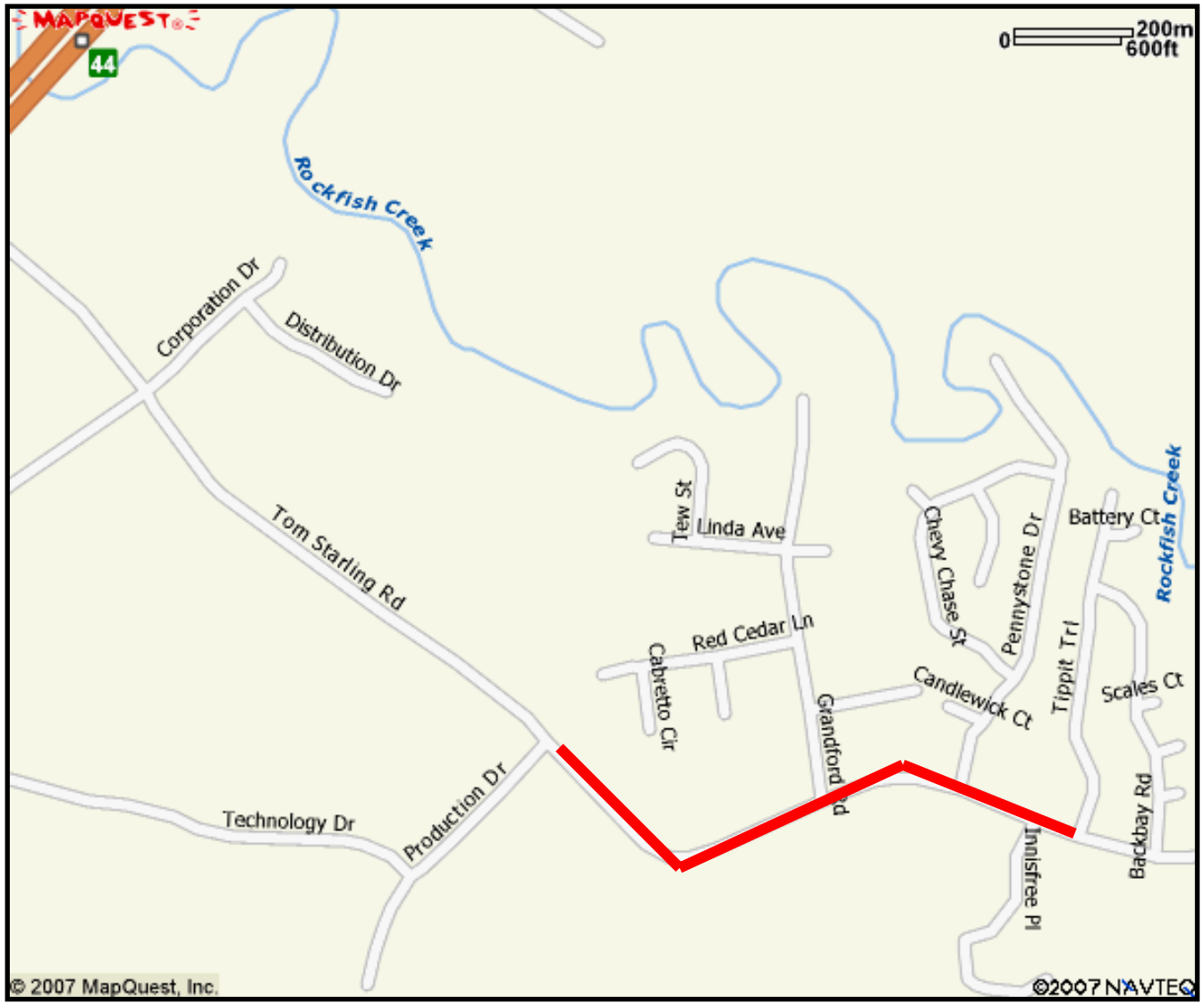
The paved shoulders also appear to have helped lower the severity of ran-off road crashes from the before to the after period. Along with a 44 percent reduction in Target Crash Severity, collisions resulting in vehicular rollover reduced from five (5) to two (2) crashes.

The calculated benefit to cost ratio for this project is 139.60 considering total crashes. The benefit to cost ratio considering only target crashes is 75.82. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are traveling east through the designated segment. Notice from the photos the newer paved shoulders, the 35 mph curve advisory, and curve warning chevrons.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Cumberland County
Evaluation of Spot Safety Project # 06-00-400



Treatment Location: SR 2220 (Tom Starling Rd) from Tippit Trail to Production Dr.
MP 1.76 – MP 2.39, Distance = 0.63 mile

TREATMENT SITE PHOTO TAKEN 8/21/2007

Traveling East on SR 2220 (Tom Starling Rd) at Production Drive
The beginning of 2 foot shoulders

Traveling East on SR 2220 at major curve

Traveling East on SR 2220 at Grandford Road

Traveling East on SR 2220 at East End of Countermeasure

Traveling West on SR 2220 at Innisfree Plaza
Curve Warning Sign, 35 MPH Advisory Speed

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2220 (Tom Starling Rd) BY: JBS
COUNTY: Cumberland DATE: 10/12/2007
FILE NO.: SS 06-00-400 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - 2' Paved Shoulder

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$20,000	20	0.102	$2,037
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	20	0.102	$2,037

ESTIMATED INCREASE IN ANNUAL MAINT. COST = ($126)
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $1,911
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.25	2	0.47	14	3.29	6	1.41	$300,094
AFTER	4.25	0	0.00	7	1.65	4	0.94	$33,318

Annual Benefits from Crash Cost Savings $266,776

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $264,865

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 139.60

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - 139.60

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 2220 (Tom Starling Road) BY: JBS
COUNTY: Cumberland DATE: 10/12/2007
FILE NO.: SS 06-00-400 NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - 2' Paved Shoulder

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$20,000	20	0.102	$2,037
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$20,000	20	0.102	$2,037

ESTIMATED INCREASE IN ANNUAL MAINT. COST = ($126)
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $1,911
TOTAL COST OF PROJECT= $20,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

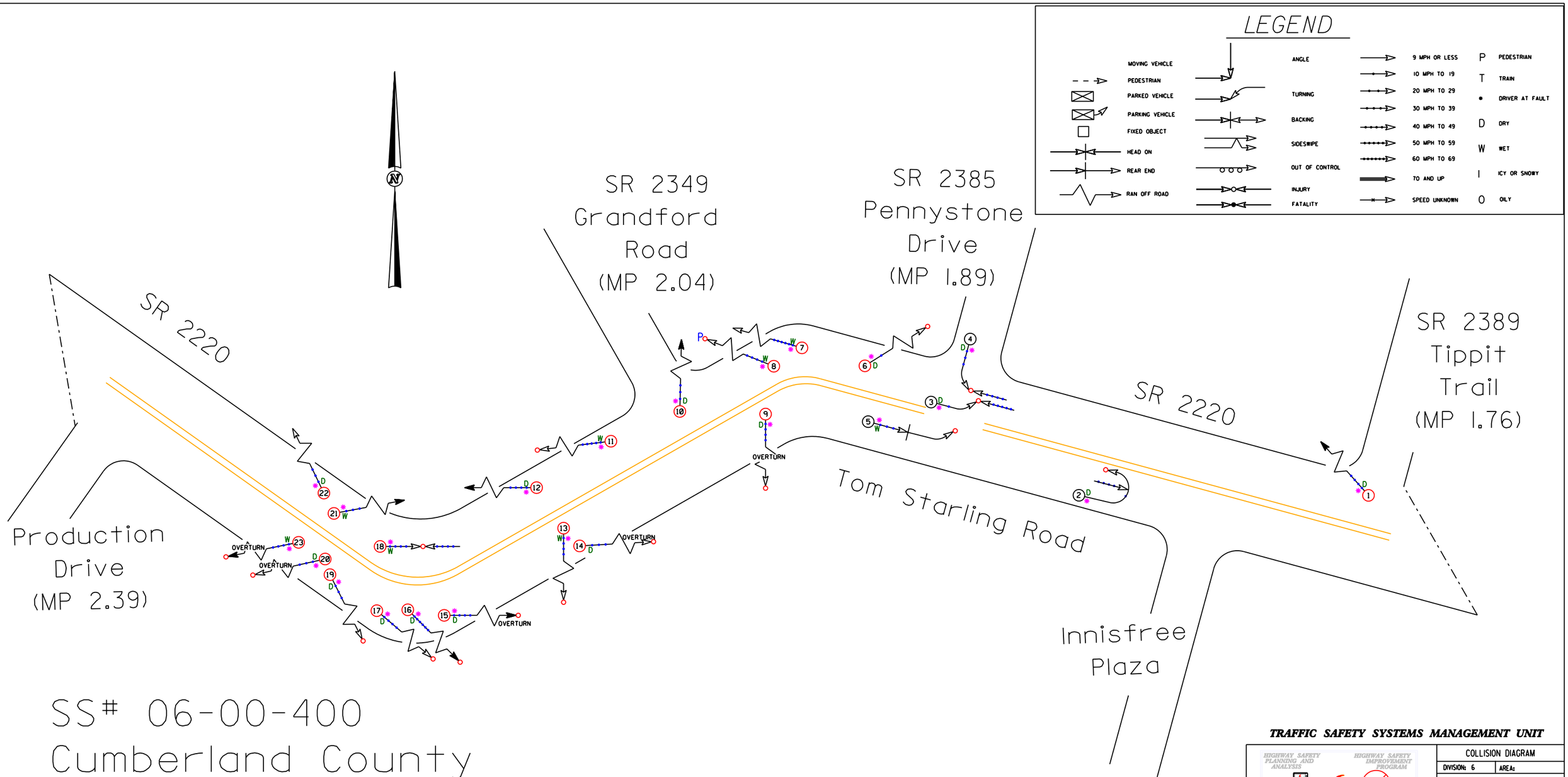
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.25	1	0.24	12	2.82	6	1.41	$173,976
AFTER	4.25	0	0.00	6	1.41	4	0.94	$29,082

Annual Benefits from Crash Cost Savings $144,894

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $142,983

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 75.82

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - 75.82

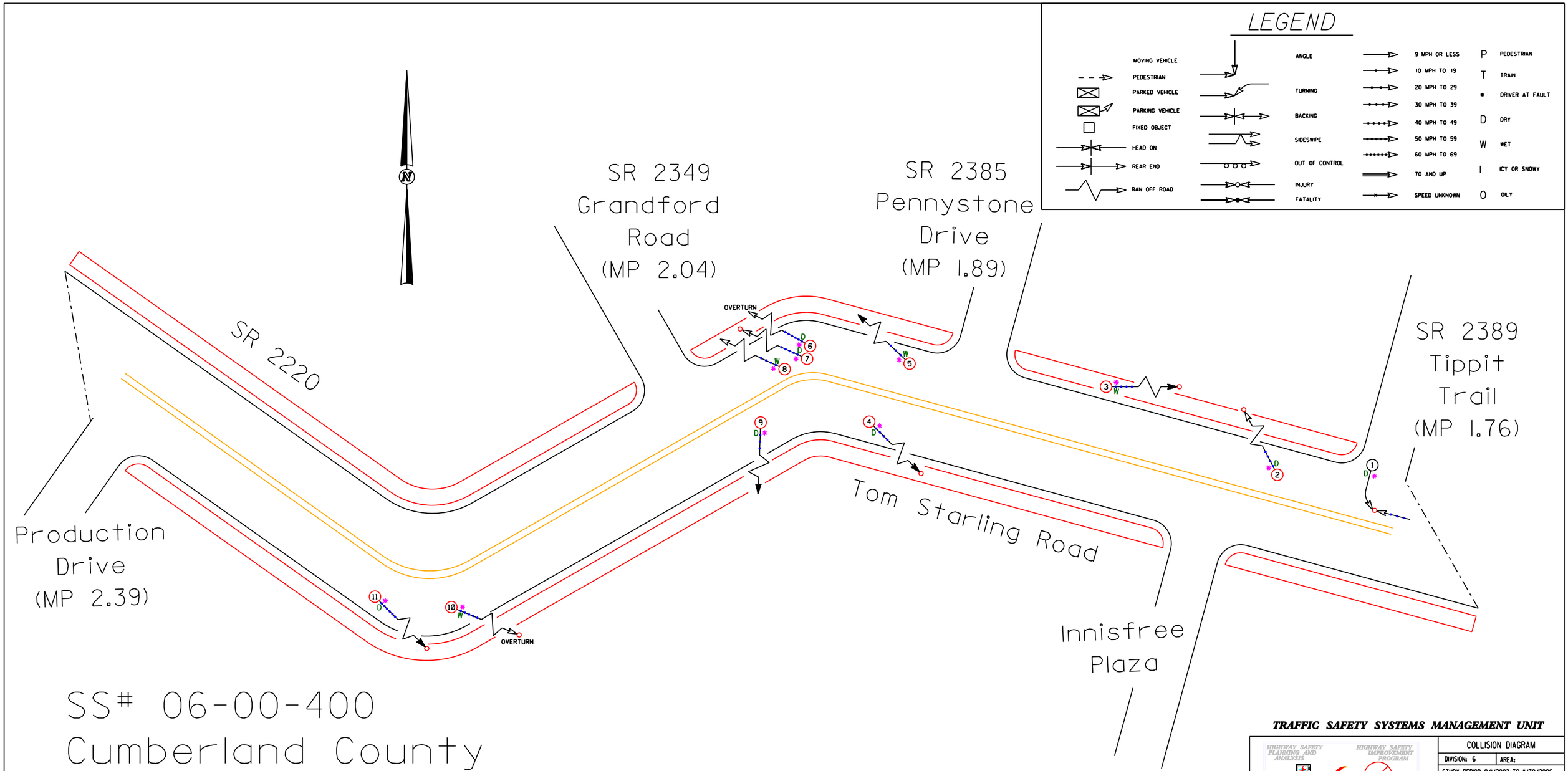


SS# 06-00-400
Cumberland County
Before Period
12/1/97 - 2/28/02
SR 2220 (MP 1.76 - 2.39)

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 12/1/1997 TO 2/28/2002	
DISTANCE: Y-LINE = 0 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	NOT TO SCALE
DATE: 12/18/2007	
LOG NUMBER: SS# 06-00-400	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH



SS# 06-00-400
Cumberland County
After Period
9/1/02 - 11/30/06
SR 2220 (MP 1.76 - 2.39)

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 6	AREA:
STUDY PERIOD: 9/1/2002 TO 11/30/2006	
DISTANCE: Y-LINE = 0 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	NOT TO SCALE
DATE: 12/18/2007	
LOG NUMBER: SS# 06-00-400	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH